

A NEW SPECIES OF *NOSEBUS* (COLEOPTERA: ZOPHERIDAE) FROM MEXICO

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Abstract.—A new species of the family Zopheridae, *Noserus doyeri* García-París, Coca-Abia, and Parra-Olea, NEW SPECIES, is described from the State of Nuevo León in México. The species is characterized by the presence of a dense velvety cover of scalfiform setae and by its smooth non-prominent elytral tuberculation. The range of the genus *Noserus* extends along two disjunct geographic areas. The first, which includes a group of poorly defined forms allied to *N. plicatus*, is restricted to the Pacific regions of California. The second group includes two species, *N. doyeri*, so far restricted to Cerro Potosí in the uplands of Nuevo León, and *N. emarginatus* from Texas. The external appearance of the three species of *Noserus* is strikingly diverse, and they may represent at least two independent phyletic lineages not necessarily sister to each other.

Key Words.—Insecta, Taxonomy, Coleoptera, Zopheridae, *Noserus doyeri* n. sp., North America, México.

Resumen.—Se describe una especie nueva de la familia Zopheridae, *Noserus doyeri* García-París, Coca-Abia, and Parra-Olea, SPECIES NOVA, del Estado de Nuevo León en México. La especie se caracteriza por el denso recubrimiento aterciopelado de sedas escamosas y por la poca prominencia de los tubérculos elitrales, que sobresalen poco o nada de la superficie elitral. Las especies del género *Noserus* se incluyen en dos grupos con distribución geográfica disjunta. El primer grupo incluye un conjunto de razas poco definidas relacionadas con *N. plicatus*, y se restringe a las regiones del Pacífico de California. En el segundo grupo se incluyen dos especies, *N. doyeri* hasta el momento exclusiva del Cerro Potosí en las montañas de Nuevo León, y *N. emarginatus* de Texas. El aspecto externo de las tres especies de *Noserus* es sorprendentemente diverso, de forma que el género podría incluir al menos dos linajes independientes, no necesariamente hermanos.

The family Zopheridae, first proposed by Böving & Craighead (1931) on the basis of larval characters, is currently integrated by two subfamilies, Usechinae and Zopherinae and a few Australian genera, *Docalis* Pascoe, *Cotulades* Pascoe, and *Latometus* Erichson, of difficult placement within either zopherid subfamily (Doyen & Lawrence 1979, Lawrence 1994, Lawrence & Newton 1995). The content and diagnosis of the zopherid subfamilies Usechinae and Zopherinae have suffered relatively few modifications since Gebien's World catalogues of Tenebrionidae (1910, 1937). Only the addition of new species, the transfer of *Exeniotis* Pascoe to the Tenebrionidae s. str., or the placement of some of Casey's (1907a, b) genera as junior synonyms of *Zopherus* Gray and *Nosoderma* Solier (Triplehorn 1972, Doyen & Lawrence 1979) are significant. The subfamily Zopherinae, a relatively homogeneous group on external appearance, includes 65 species distributed in 8 genera. Keys to genera of New World Zopheridae, and generic synonyms, have been provided by Doyen & Lawrence (1979), and the genus *Zopherus* has been comprehensively revised by Triplehorn (1972), but no other genera of Zopherinae have been critically revised.

The genus *Noserus* LeConte (1862), is characterized within the subfamily Zopherinae by having the two apical segments of the antennae fused, the inner

surface of the femora of males with tuberosities, and by the presence of a shallow, but marked short hypomeral groove that does not completely contain the antennae while in repose (Doyen & Lawrence 1979). Until present, the genus included a group of poorly defined species closely related to *Noserus plicatus* (LeConte), 1859, restricted to California (Casey 1907a, b), and *Noserus emarginatus* Horn (1878), a well defined species known from Texas (USA) and Mexico (García-París et al. 2000).

Based on comparisons among specimens of the North American genera *Mer-alius*, *Noserus*, *Nosoderma*, *Phellopsis*, *Phloeodes*, and *Zopherus*, and a series of zopherine beetles collected at Cerro Potosí (Nuevo León, México), we believe the latter share more traits with *Noserus* than with any other genera of Zopheridae, including: (1) the presence of a short, shallow hypomeral groove that does not completely contain the antennae while in repose, (2) the two apical segments of the antennae fused, and (3) the presence of a narrow longitudinal area not covered by setae in the ventral mid-line of each tarsal segment, which appear to be grooved. These specimens do not match any known species of zopherine beetle and therefore we include their description in the following paragraphs.

Depository Abbreviations.—The following abbreviations are used to indicate deposition of specimens: CAS (California Academy of Sciences, San Francisco, USA), EM-UCB (Essig Museum of Entomology, University of California at Berkeley, USA), IB-UNAM (Instituto de Biología, Universidad Nacional Autónoma de México, México), MCZ (Museum of Comparative Zoology, Harvard University, Cambridge, USA), and MNCN (Museo Nacional de Ciencias Naturales, CSIC, Madrid, Spain).

Methodology.—Dry mounted specimens were used for descriptions and drawings. External sculpture and pubescence and dissected mouth parts were studied with Scanning Electron Microscopy (SEM). Preparations of male and female genitalia were obtained from alcohol preserved specimens. Aedeagus and median lobe were removed and studied at the dissecting microscope immersed in distilled water, and with SEM. Female genitalia and genital segment were cleared with a hot 5% KOH solution, progressively dehydrated in 70%, 90%, 95% and 100% ethanol, and mounted in Euparal for examination at the dissecting microscope. Drawings of the female genitalia were performed using camera-lucida.

NOSEBUS DOYENI GARCÍA-PARÍS, COCA-ABIA & PARRA-OLEA NEW SPECIES
(Figs. 1–30)

Types.—Holotype: MEXICO: NUEVO LEÓN: Cerro Potosí, 2600–3200 m, 23 May 1996, M. García-París and G. Parra-Olea: IB-UNAM. Paratypes (36 specimens): 1–3: same data as holotype; 4: same data as holotype, except: MNCN; 5–33: same data as holotype, except: 10,300 ft., 25 Sep 1975, J. Powell, J. Chemsak, and T. Freilander: EM-UCB; 34–36: same data as holotype, except: 11,000 ft, Galeana, 5 Aug 1938, H. Hoogstraal: CAS.

Diagnosis.—Zopherine beetle distinguished by its smooth, non-prominent dorsal and lateral tuberculation, completely covered by dense scaliform setae. Posterior declivity of the elytra smooth, without tubercles. The two apical segments of the antennae are fused. A shallow but marked short hypomeral groove that does not completely contain the antennae while in repose is present on the ventro-

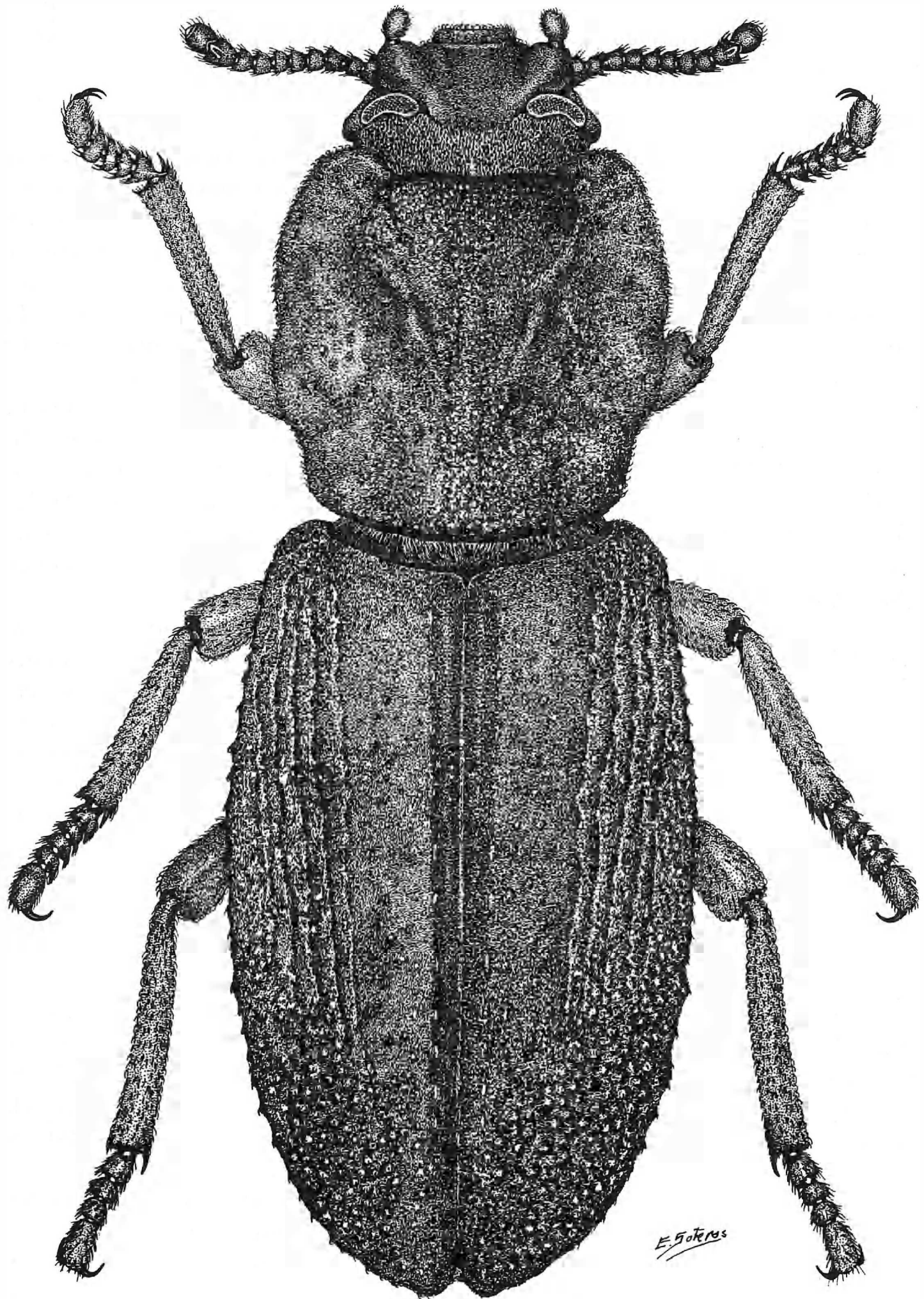
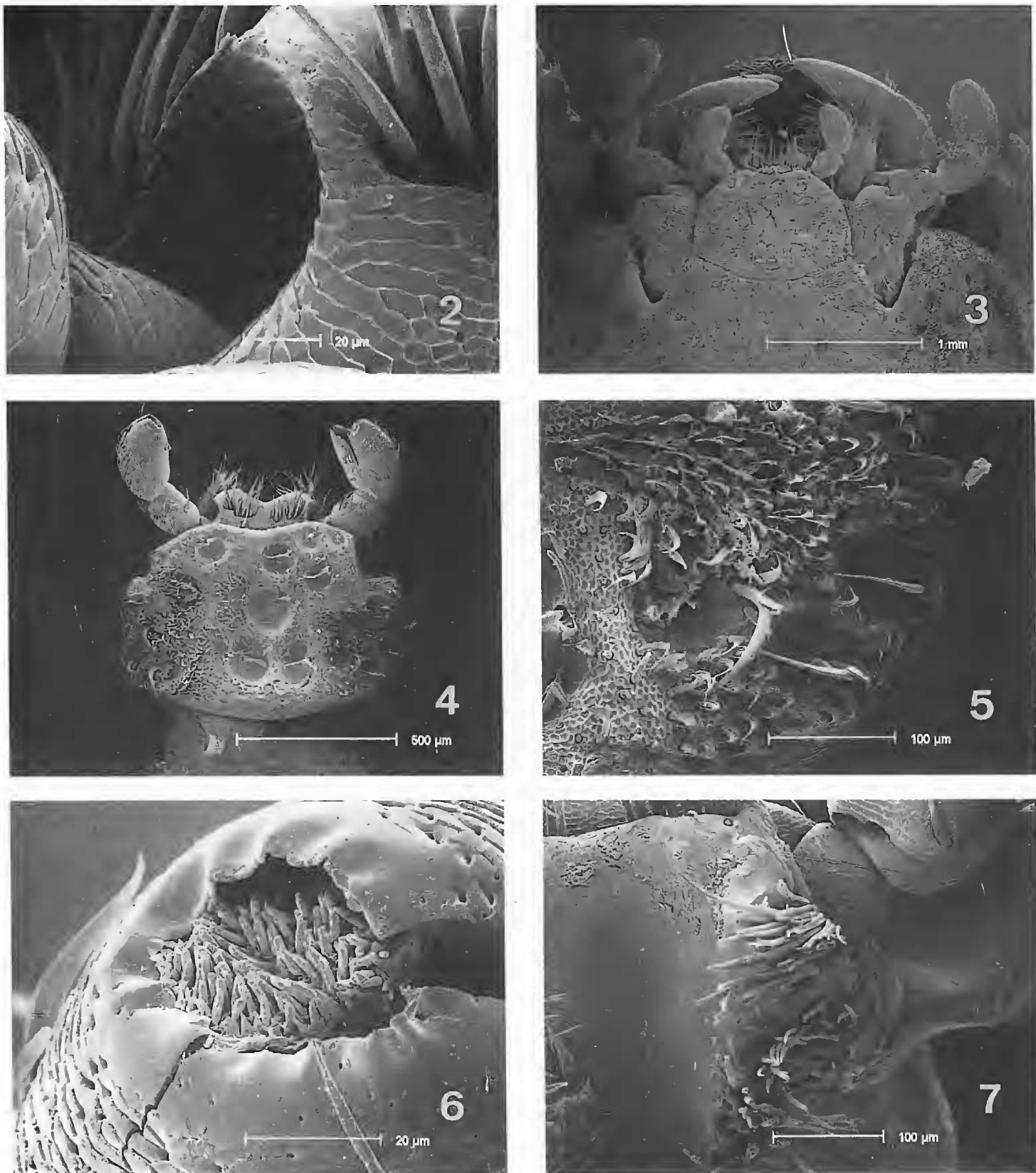


Figure 1. Habitus of *Noserus doyeri* sp. nov. from Cerro Potosí (Nuevo León, México).

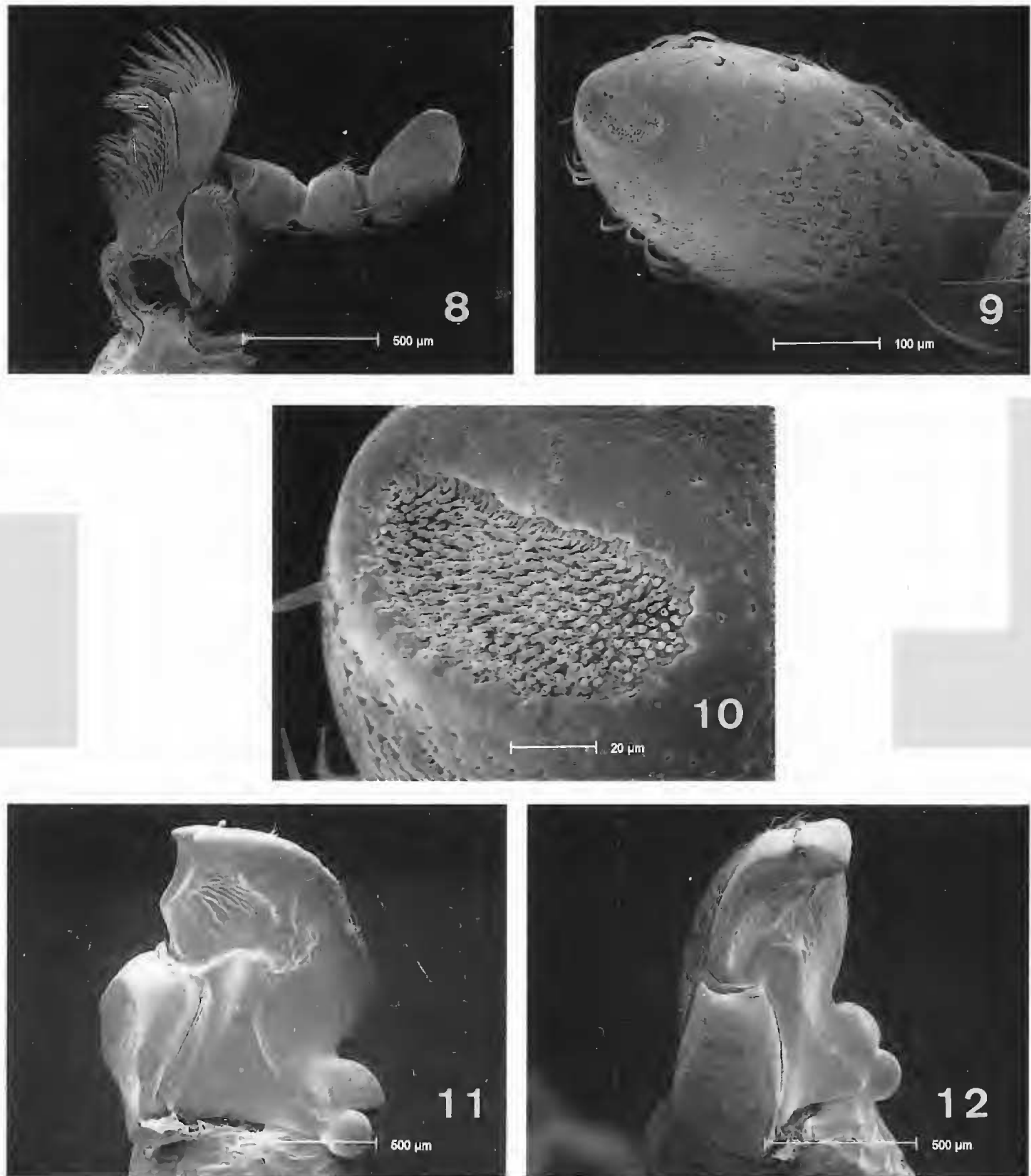


Figures 2–7. Cephalic and bucal morphology of *N. doyeri*. Figure 2. Detail of the tegument at the labial palp insertion region. Note the juxtapsed or slightly imbricate tegulae. Figure 3. Ventral view of the mouth region showing the gular v-shaped incisions which accommodate the maxillary basistipe. Figure 4. Ventral view of the mentum and labial palpi. Figure 5. Dense pubescence at the mental margins. Figure 6. Sensory organs at terminal opening of the labial palp. Figure 7. Dorsal pubescence at the insertions of the labial palp.

lateral surface of the pronotum. Posterolateral corners of the pronotum smoothly rounded, not angular.

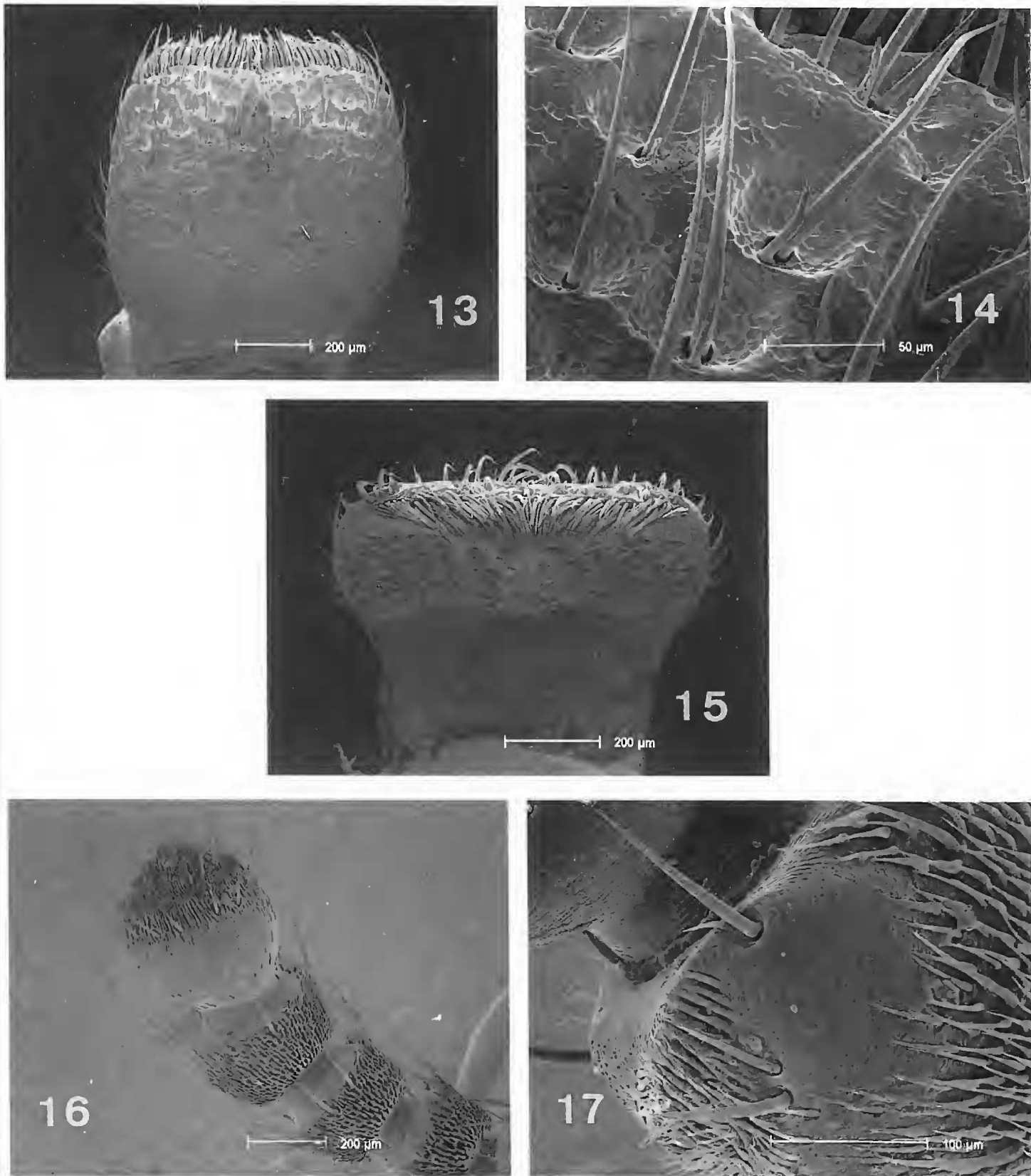
Description.—Habitus as in Fig. 1. Coloration uniformly castaneous, with most of the body closely covered with squamiform, curved, golden to brown setae, with scattered hooked black to brown setae particularly evident at the margin of the prothorax. Live specimens present a velvety, almost furry, aspect. Tegument formed by irregularly shaped tegulae, juxtapsed or partially imbricated (Fig. 2).

Head inserted into the prothorax as far as the antennal insertions while in repose; epistoma medially



Figures 8–12. Buccal morphology of *N. doyeri*. Figure 8. Ventral view of the maxilla. Note the pubescence of the lacinia and galea. Figure 9. Terminal segment of the maxillary palp. Figure 10. Terminal ovate fossa of the maxillary palp with internal sensory papillae. Figure 11. Ventral view of the mandible. Note the shape of the incissor and molar lobes. Figure 12. Lateral view of the mandible.

depressed, laterally inflated, densely covered by squamiform, golden setae. Gular suture arcuate; deep gular v-shaped incisions, broadly opened, which accommodate the maxillary basistipe (Fig. 3). Mentum (prementum) subrectangular with arcuate posterior margin (labial suture), and smoothly emarginate anterior edge (Fig. 4); ventral surface of the mentum setose with shallow broad fossae bearing laterally a single long curved hair; mental margins densely setose (Fig. 5); labial palpi robust with a broad terminal opening, showing the internal, non-protruding, sensory organs (Fig. 6); insertions of the labial palpi with tufts of dense long setae directed inwards towards the oral cavity (Fig. 7). Maxillae with lacinia and galea densely setose (Fig. 8); maxillary palpi with non-terminal segments short and robust, covered by setae on most of their dorsal surface; terminal segment of the palpi (Fig. 9) elongate,



Figures 13–17. Buccal morphology and antennae of *N. doyeri*. Figure 13. Dorsal view of the labrum. Figure 14. Detail of the setiferous fossae on the dorsal surface of the labrum. Figure 15. Anterior edge of the labrum in ventral view. Figure 16. Antennal segments 7–11. Note the fusion of the terminal segments and the protruding denuded area in segment 9. Figure 17. Detail of the protruding smooth area in the 9th segment of the antenna.

fusiform, with scattered long setae and a terminal ovate fossa with internal sensory papillae (Fig. 10); basistipe well developed, with a marked hump. Mandibles robust and strong, joined to the head by a single point of articulation and several muscles; each mandible has a triangular base, and its mesal surface is differentiated into a very sharp, distal toothed incisor lobe (Fig. 11) and a proximal molar lobe flat and smooth, with poorly defined transversal grooves (Fig. 12). Labrum relatively small (Fig. 13), strongly punctured ventrally, with deep dorsal setiferous fossae (Fig. 14), and small setae at the anterior edge (Fig. 15). Antennae with segments 2 and 4–8 subquadrate, wider than long, densely covered by strong acute setae; segment 3 longer than wide; segment 9 conical, wider than the other

segments at its distal portion (Fig. 16), with a well marked smooth denuded area slightly protruding anteriorly (Fig. 17); articles 10 and 11 fused forming a sub-sphaeric terminal segment (Fig. 16).

Prothorax subrectangular in dorsal outline, longer than wide, slightly wider at its first third, with prominent anterior lobed lateral angles that cover genae and eyes; posterolateral corners smoothly rounded, not prominent (Fig. 1); base of thorax arcuate; dorsal surface completely covered with squamiform, curved golden-brown setae; ventral surface of the prothorax densely covered by setae, with occasional deep fossae, and a very short but marked hypomerall groove in the anterior portion (Fig. 18). Scutellum hidden under the elytra, small and densely covered by postrate setae, each originating from basal granuli (Fig. 19).

Legs completely pilose except a smooth patch on the internal surface of the femora of males (Fig. 20); the surface of these black ovate tuberosities is smooth with fine pores unevenly dispersed (Fig. 21); ventral surface of tarsus with two rows of divergent setae that give a grooved appearance to the tarsus (Fig. 22); terminal tarsal segment with strong claws (Fig. 23).

Elytra 1.6 to 1.8× longer than wide, with shallow humeral impressions, and faded posterior tuberculation, densely covered by squamiform golden brown setae (Fig. 24); dispersed small setiferous fossae are almost completely obliterated by pilosity (Fig. 25); posterior elytral depressions absent; sutural region depressed; apices rounded, not touching each other (Fig. 1).

Male genitalia including a well developed genital segment which corresponds to the eighth and ninth abdominal sternites. Aedeagus with parameres dorsally fused, their apices pubescent and less sclerotized than the rest (Fig. 26); phallobase ventrally opened and shorter than the parameres (P/Ph ratio about $\frac{1}{3}$). Median lobe long and thin (Fig. 27), its apex obliquely truncated and distally opened, with the terminal portion narrowly rounded and with scattered deep fossae (Fig. 29). The endophallus is a membranous sac that seems empty at low magnification.

The female genitalia (Fig. 30) consist of two ovaries, two lateral oviducts converging posteriorly from the ovaries, a median oviduct (oviductus communis) receiving the lateral ducts anteriorly, the gonopore opened to the exterior on the eighth abdominal segment, a spermatheca (receptaculum seminis), two accessory glands, and the vagina, a tubular exit passage from the median oviduct to the genital chamber. The eighth abdominal segment is well developed and it is associated with the genital chamber which is modified in an organ formed of appendicular parts, serving for the deposition of the eggs; this organ is not a real ovipositor but it can be protracted like a tube, having the opening of the egg passage near its distal end; the functional ovipositor is composed of a pair of dorsal and ventral elongate processes or threads, which give stiffness to this part of the female genitalia; the ventral wall is longer than the dorsal and it has a sclerotized median rod in the middle and two distal genital palpi with sensillae.

Length (elytra plus prothorax), 14.5–17.7 mm.

Variability.—Paratypes 5–33 are covered by a dark exudate that obliterates most of the scalation, tuberculation, and fossae. Coloration of these specimens is brown-black with dorsal shiny reflections from the exudate. Some specimens present small dorsal tubercles along the striae, completely covered by golden setae.

Secondary sexual characters.—Males have a large oval black tuberosity completely free of setae on the interior surface of the femora.

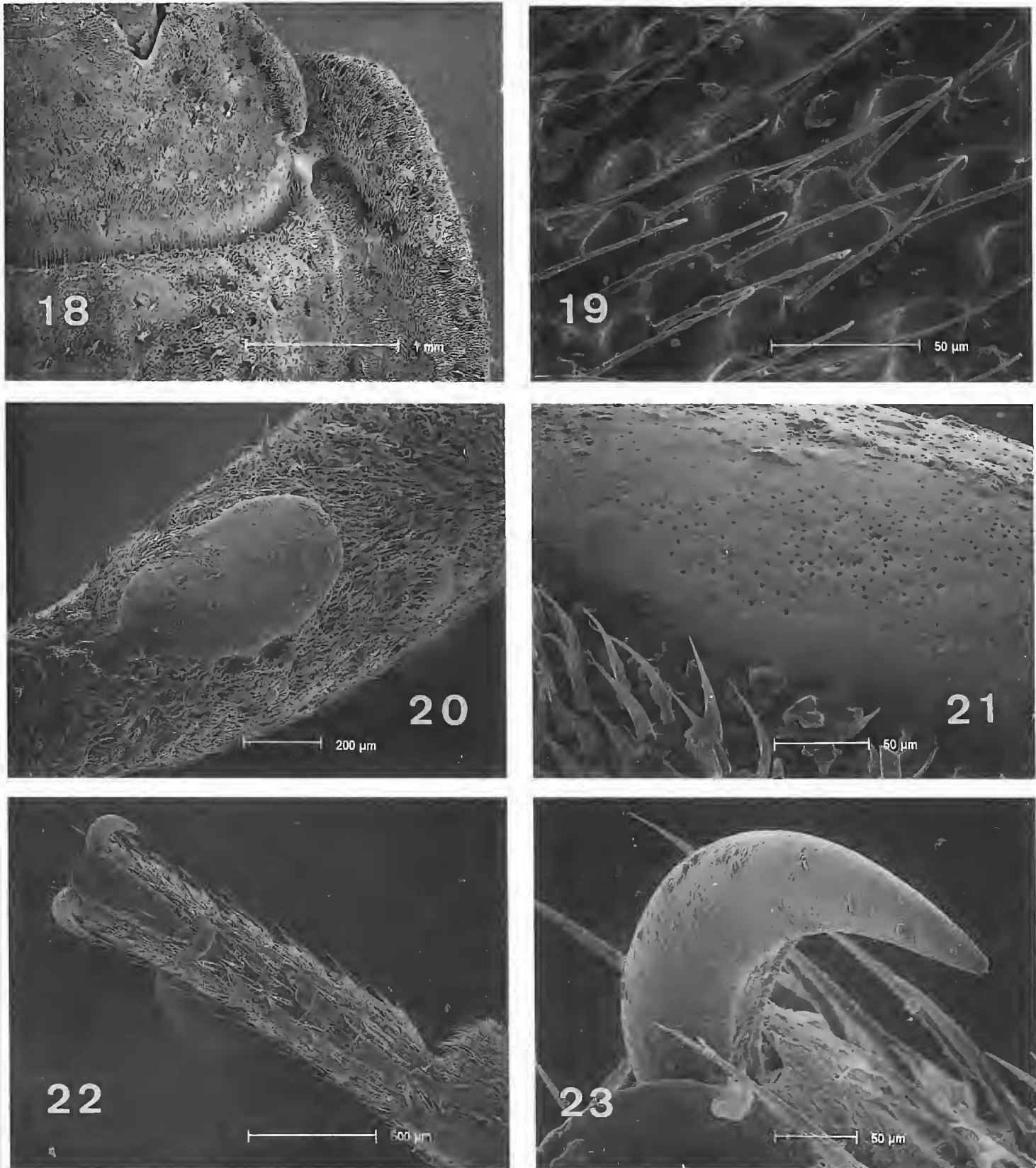
Etymology.—This species is named to honor John T. Doyen whose contributions to the systematics of Neotropical and Nearctic tenebrionoids have been substantial to present and future workers on the group, and who kindly provided us with his material for the description of the new species.

Geographic Range.—Known only from the type locality, the Cerro Potosí in Nuevo León, México.

Ecological Remarks.—The species was found under loose bark of dead pine stumps, often in company of the plethodontid salamander *Chiropoterotriton priscus* Rabb 1956, at elevations ranging from 2600 to 3200 m.

Material Examined.—37 specimens of *Noserus doyeni*: The type series indicated above plus one additional specimen used for the SEM study, MEXICO: NUEVO LEÓN: Cerro Potosí, 2600–3200 m, 23 May 1996, M. García-París and G. Parra-Olea: 1 specimen (MNCN).

Additional specimens of *N. plicatus* from California ($n = 11$; MNCN), *N. emarginatus* from Texas,

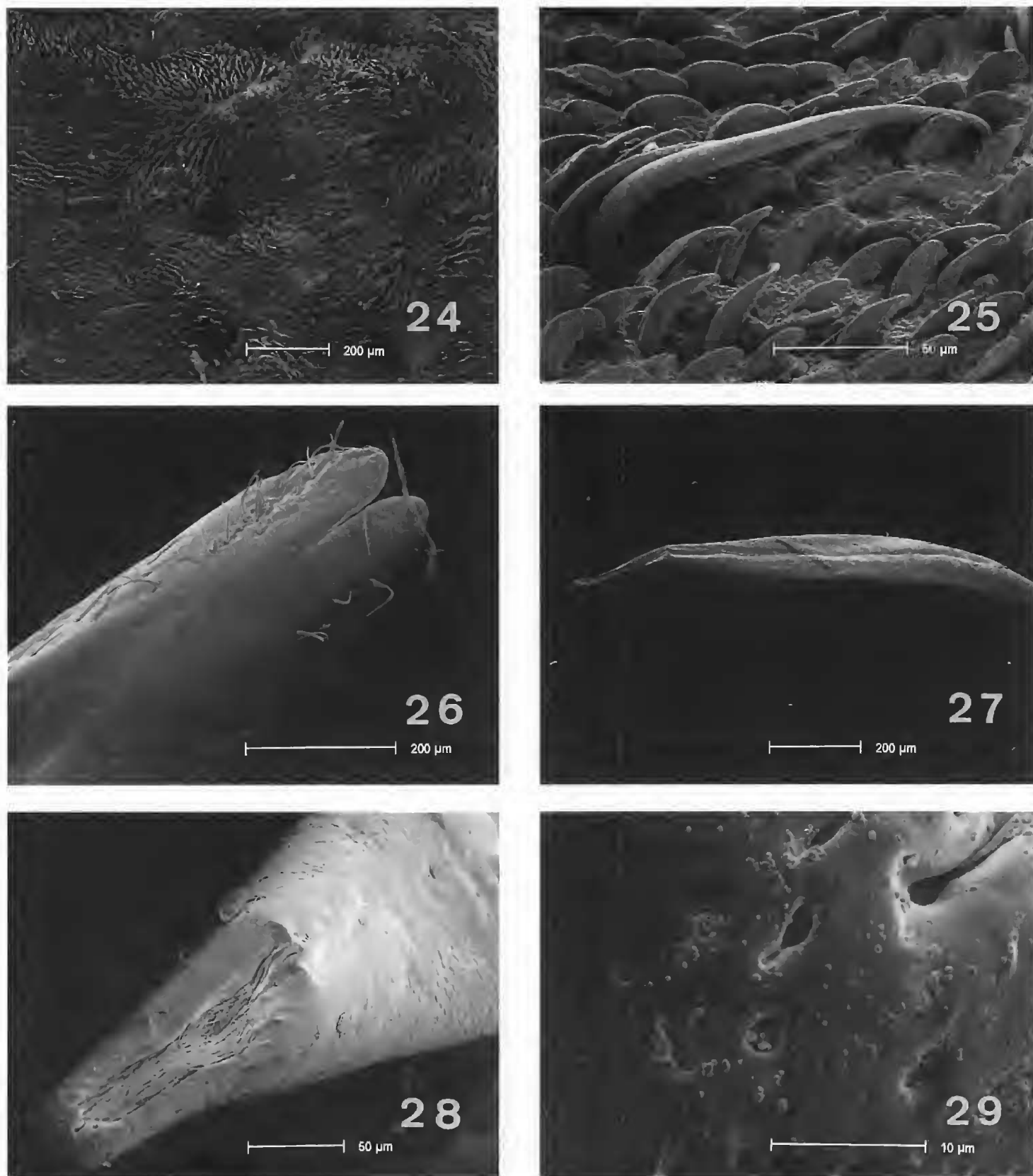


Figures 18–23. Taxonomic characters of *N. doyeri*. Figure 18. Ventral view of the posterior portion of the head and the lateral area of the prothorax. Note the short hypomerale groove and the ventral fossae. Figure 19. Detail of the pubescence on the scutellum. Figure 20. Oval tuberosity on the internal surface of the femora of males. Figure 21. Detail of the surface of the femoral tuberosity, showing the pores and the lack of pubescence. Figure 22. Ventral view of the tarsus. Figure 23. Terminal claw of the tarsus.

including the holotype ($n = 3$; MCZ), and representatives of all the North American genera of Zopherinae: *Phloeodes*, *Nosoderma*, *Meralius*, *Phellopsis* and *Zopherus* (CAS, EM, MNCN) were also examined.

KEYS TO SPECIES OF ADULT NOSERUS

In the following key all the geographic forms restricted to California (Casey 1907a, b) and closely related to *Noserus plicatus* are included under that name.



Figures 24–29. Taxonomic characters of *N. doyeri*. Figure 24. Dorsal view of the elytral pubescence at the disc region. Figure 25. Detail of the elytral pubescence. Note the density of the squamiform setae and the isolated long hair corresponding to the hidden dorsal setiferous foveae. Figure 26. Dorsal view of the parameri of the male genitalia. Note the pubescence on the lateral regions. Figure 27. Lateral view of the median lobe of the male. Note the obliquely truncate apex. Figure 28. Distal opening of the median lobe. Figure 29. Detail of the deep fossae of the distal region of the median lobe.

- 1. Elytral tuberculation reduced, not prominent to almost obliterate, and completely hidden by dense pilosity. Posterior declivity of elytra smooth *N. doyeri*
- *. Elytral tuberculation strong, especially prominent at the posterior half.

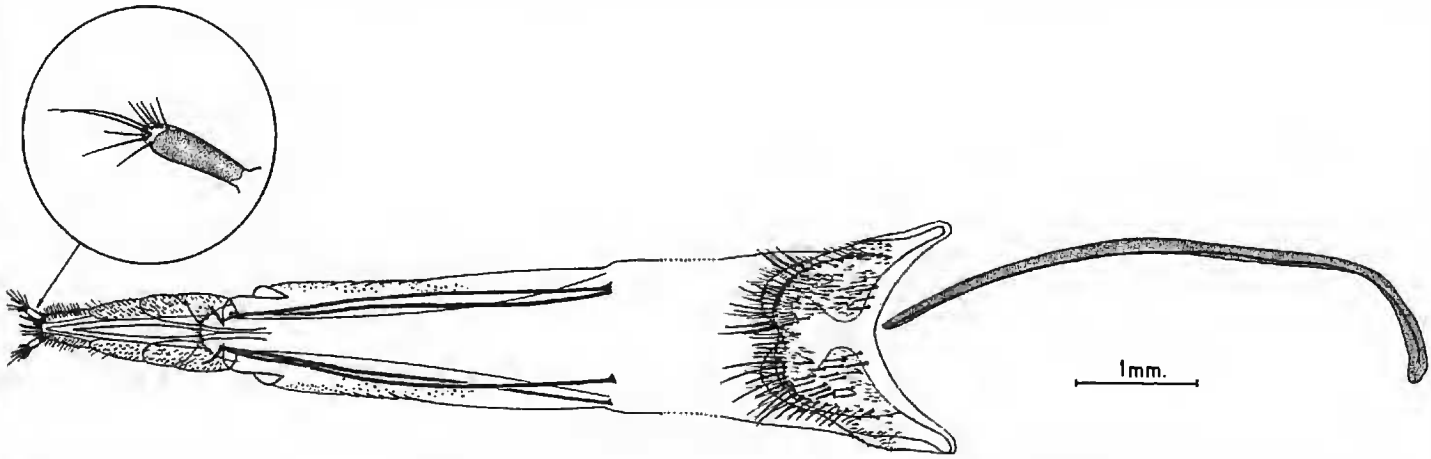


Figure 30. Female genitalia. Broken lines indicate the region is longer than shown.

- Dorsal pilosity does not hide the posterior tubercles. Posterior declivity of elytra abrupt 2
2. Apex of the elytra deeply emarginate. Undersurface with obvious fossae and without prominent tubercles, covered by dense squamiform pilosity *N. emarginatus*
- *. Apex of the elytra not emarginate. Undersurface without large fossae, with dispersed long setae placed at the base of rounded black tubercles *N. plicatus*

Discussion.—The range of the genus *Noserus* includes two disjunct geographic areas. The first group is restricted to the Pacific regions of California. It includes a group of poorly defined forms allied to *N. plicatus*, which do not deserve a specific taxonomic status because most of their diagnostic characters are variable features widespread along the geographic range of *N. plicatus*. The second unit is distributed along the Atlantic regions of Texas (USA) and the State of Nuevo León (México) (García-París et al. 2000). This group includes two species, *N. doyeni*, so far restricted to a single mountain, the Cerro Potosí in the uplands of Nuevo León, and *N. emarginatus* from Texas. The Atlantic (Gulf of México) species share a dense dorsal velvety vestiture and the presence of deep setiferous fossae on the undersurface, not present in the Pacific *N. plicatus*.

Noserus doyeni with its furry vestiture and lack of dorsal and posterior elytral tuberculation, is one of the most easily recognized species of the Zopherinae. The single known population of this species may represent a relict of a wider distribution, along the mountains of the Sierra Madre Oriental, that was progressively restricted as a consequence of the Plio-Pleistocene aridification of the uplands of Nuevo León (Braun 1955). The range of *N. emarginatus* covers part of the humid lowlands of southern Texas, and montane forests in northeastern Mexico, but its frequency of capture is very low as inferred from the scarcity of material available in museum collections (García-París et al. 2000).

Casey (1907b) divided the Zopherinae into two tribes, the Zopherini and the Nosodermini. Casey's (1907b) Zopherini included only *Zopherus* sensu Triplehorn (1974), and Nosodermini included a highly heterogeneous assemblage of the remaining genera including *Noserus*. We follow Doyen & Lawrence (1979) and do not consider justifiable to subdivide the Zopherinae at this point, since any possible arrangement probably requires the recognition of many monotypic tribes. *Noserus* is morphologically close to the American genera *Nosoderma*, *Meralius*

and *Phloeodes*. These taxa share the fusion of the two apical segments of the antennae and the presence of tuberosities on the internal surface of the femora of males. The only apparently constant discriminating character among them is the presence of a deep hypomeral groove that completely contains the antennae when in repose in *Phloeodes*, the complete absence of the hypomeral groove in *Nosoderma* and *Meralius*, and the presence of a shallow, but marked short groove that does not completely contain the antennae in *Noserus* (Doyen & Lawrence 1979). The hypomeral groove in Atlantic *Noserus* is less developed than in the Pacific species, and altogether, *Noserus* seems to be a transitional taxon between *Nosoderma* and *Phloeodes*. The relevance of the hypomeral groove as a discriminant character within Zopherinae is undisputable, however its phylogenetic relevance is less clear because it is likely subjected to adaptive pressures, and it seems to have evolved two or three times within the family, because it also occurs in the American *Zopherus* Gray, and the Australian *Zopherosis* White, genera apparently not closely related to each other nor to *Phloeodes* or *Noserus* (Doyen & Lawrence 1979).

The external appearance of the three known species of *Noserus* is strikingly diverse, and they may represent two independent phyletic lineages, the Pacific and the Atlantic groups, rendering the genus *Noserus* possibly paraphyletic. The presence of dense dorsal velvety vestiture, deep setiferous fossae on the under-surface, and poorly defined tarsal grooves in Atlantic *Noserus* is shared by species of *Nosoderma*. However *Nosoderma* is not a morphologically homogeneous taxon (Casey 1907b, Doyen & Lawrence 1979), and any re-evaluation of the status of *Noserus* must wait for the revision, currently in progress, of this diverse genus.

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